Durability of antegrade synthetic aortomesenteric bypass for chronic mesenteric ischemia

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Objective: **The optimal treatment (endovascular/open repair, conduit, configuration) for chronic mesenteric ischemia (CMI) remains unresolved. This study was designed to review the outcome of patients with CMI treated with antegrade synthetic aortomesenteric bypass.**

Methods: **The study was designed as a retrospective review in an academic tertiary care medical center. Patients with CMI who underwent antegrade synthetic aortomesenteric bypass were identified from a computerized vascular registry (from January 1987 to January 2001) with antegrade synthetic aortomesenteric bypass as intervention. Outcome measures were functional outcome (symptom relief, weight gain) and both graft patency (duplex ultrasound/angiography) and survival rates as determined with life-table analysis.**

Results: **Forty-seven patients (female, 70%; age, 62 ± 12 years) underwent aortomesenteric bypass (aortoceliac/aortosuperior mesenteric, n = 45; aortosuperior mesenteric, n = 2) for CMI (abdominal pain, 98%; weight loss, 83%). In-hospital mortality rate was 11% (four multiple organ dysfunction, one bowel infarction), mean length of stay was 32 ± 30 days, three patients (6%) were discharged to a nursing home, and one (2%) was discharged home on parenteral nutrition (duration 4 months). At a mean follow-up period of 31 ± 27 months, all patients had relief of abdominal pain and 86% had gained weight (at ≥1 year follow-up: mean ideal body weight 103 ± 22%; versus before surgery: 87 ± 17%; $P < .001$). Fourteen patients (34%) had diarrhea at discharge that persisted more than 6 months in 10. One patient had acute mesenteric ischemia develop from a failed graft (at 20 months), two patients had recurrent CMI develop from failing grafts (at 46 months and 49 months), and one asymptomatic patient was found to have a failing graft with duplex ultrasound scan (at 17 months); all grafts were revised. Primary, primary assisted, and secondary 5-year graft patency rates with life-table analysis were 69% (standard error [SE], 17%), 94% (SE, 7%), and 100%, respectively, and the 5-year survival rate was 74% (SE, 12%).**

Conclusion: **Antegrade synthetic aortomesenteric bypass for CMI is associated with good functional outcome and long-term graft patency. (J Vasc Surg 2002;35:1078-84.)**

Chronic mesenteric ischemia is uncommon, although the incidence rate may be increasing because of better awareness of associated symptoms and improved screening for mesenteric arterial occlusive disease with duplex ultrasound scan. Open surgical reconstruction has been the primary treatment, but the reported series documenting outcome are generally small and many controversies persist regarding the optimal treatment. These controversies include the type of revascularization (open surgical repair versus endovascular), the type of surgical repair (transaortic endarterectomy versus aortomesenteric bypass grafting, antegrade versus retrograde bypass), and the number of mesenteric arteries that should be treated (single versus multiple vessel reconstruction). Furthermore, few reports document long-term patency after revascularization and functional outcome with objective measures. This further complicates evidence-based decision making for patients with chronic mesenteric ischemia. This study was designed to determine the long-term functional outcome and graft patency in patients with chronic mesenteric ischemia treated at single institution with antegrade synthetic aortomesenteric bypass.

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Competition of interest: nil.

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PATIENTS AND METHODS

Seventy-two patients who underwent mesenteric arterial reconstruction at the University of Florida College of Medicine between January 1987 and January 2001 were identified with a computerized vascular registry. Of these, 47 patients had undergone revascularization for chronic mesenteric ischemia with antegrade synthetic aortomesenteric bypass and form the basis of this study. Only patients treated for abdominal pain or otherwise unexplained weight loss and severe mesenteric arterial occlusive disease were included. Patients who underwent reconstruction for acute mesenteric ischemia, asymptomatic mesenteric arterial occlusive disease, and mesenteric arterial aneurysm were specifically excluded.

The complete medical records of these patients, including both inpatient and outpatient notes, were retrospectively reviewed to determine the presenting symptoms, preoperative evaluation, operative procedure, and perioperative outcome. Standard complications were documented, and organ system failure was determined with a previously reported scoring system.[1] Preoperative mesen-

teric arteriograms were examined to determine the distribution and degree of mesenteric arterial occlusive disease. Follow-up clinic records were examined to assess symptomatic improvement and functional outcome (weight gain, dysmotility symptoms, living status), and mesenteric duplex ultrasound scan studies or follow-up mesenteric arteriograms (done to confirm duplex ultrasound scan studies suggesting significant graft stenosis or occlusion) were reviewed to determine graft patency. All patients who underwent mesenteric bypass in our practice are routinely followed with clinic appointments and duplex ultrasound scans every 6 months. The duplex scan criteria used to assess both graft and native artery stenoses or occlusions have been previously described (>50% superior mesenteric artery stenosis: peak systolic frequency > 4.5 kHz; >50% celiac axis stenosis: peak systolic frequency > 4 kHz).[2] The mean follow-up period was 31 ± 27 months (range, 1 to 119 months). Only four patients did not have complete follow-up, and these were lost to follow-up at an average of 18 months after revascularization.

The mean patient age was 62 ± 12 years, and 33 patients (70%) were female. All patients had symptoms consistent with chronic mesenteric ischemia, and the duration of the symptoms before revascularization averaged 12 months (range, 1 to 36 months). Forty-six patients (98%) reported abdominal pain, and the character of the pain was postprandial in 85%. Thirty patients (64%) had diarrhea, 10 patients (21%) had constipation, and four were documented to have delayed gastric emptying with nuclear imaging studies. Twenty-two patients (47%) had documented gastric ulcers or gastritis, nine (19%) had undergone previous abdominal surgical procedures for treatment of these symptoms, and 11 (23%) had undergone previous mesenteric arterial reconstructive procedures (four mesenteric bypasses, seven mesenteric angioplasties). Overall, the patients' calculated mean ideal body weight was 88 ± 16% before mesenteric revascularization; 39 patients (83%) had lost weight before operation, with a mean loss of 35 ± 19 lbs. Seventeen patients (36%) were seen with an exacerbation of their chronic symptoms and underwent urgent revascularization. Most of these were referred to our institution with a diagnosis of chronic mesenteric ischemia supported with characteristic arteriographic findings. Revascularization was performed on an urgent basis because of the potential to progress to acute mesenteric ischemia and bowel infarction. No patients had previous bowel resections for ischemia, but one patient had undergone a right hepatectomy for infarction caused by mesenteric occlusive disease.

A history of tobacco use was present in 43 patients (91%), hypertension in 36 (77%), coronary artery disease (documented by previous myocardial infarction, prior coronary revascularization, or current angina) in 18 (38%), cerebral vascular occlusive disease in 16 (34%), chronic obstructive pulmonary disease in 10 (21%), hypercholesterolemia in five (11%), and diabetes mellitus in two (4%). In addition, diffuse peripheral arterial occlusive disease as shown with a prior lower extremity arterial revascularization procedure or a history of claudication and reduced ankle brachial indices was present in 23 patients (49%).

Table I. Preoperative mesenteric arteriogram

Artery	*Occlusion*	*Stenosis > 50%*	*Stenosis < 50%*
Celiac axis	22 (47%)	24 (51%)	1 (2%)
Superior mesenteric	25 (53%)	20 (43%)	2 (4%)
Inferior mesenteric	28 (60%)	10 (21%)	9 (19%)

Table II. Significant mesenteric occlusive lesions (occlusion or >50% stenosis) with preoperative arteriography

Artery	*Patients*
Celiac axis + superior mesenteric + inferior mesenteric	36 (77%)
Celiac axis + superior mesenteric	8 (17%)
Celiac axis alone	1 (2%)
Celiac axis + inferior mesenteric	1 (2%)
Superior mesenteric + inferior mesenteric	1 (2%)

Review of the arteriograms, including the lateral projections, showed that the overwhelming majority of patients (94%) had significant stenosis or occlusion of both the celiac axis and superior mesenteric artery, with 77% of the patients having significant disease in all three visceral vessels (Tables I and II). Notably, only one patient had disease isolated to a single mesenteric vessel (celiac axis). Atherosclerosis was the cause of the mesenteric arterial occlusive disease in all but one patient (age, 35 years) who was suspected of having Takayasu's arteritis.

All patients underwent antegrade aortomesenteric arterial bypass with a synthetic bypass graft originating from the supraceliac aorta. Forty-five patients had bifurcated grafts to the celiac axis and the superior mesenteric artery, and two patients had antegrade bypass to the superior mesenteric artery alone. One of the latter two patients had minimal occlusive disease of the celiac axis, and one had an asymptomatic occlusion of the celiac limb of a previous antegrade aorta celiac/superior mesenteric artery bypass done with greater saphenous vein and had recurrent symptoms develop only when the superior mesenteric artery limb thrombosed. Eight patients also had repair of the inferior mesenteric artery (bypass with vein, n = 2; reimplantation/patch repair, n = 6), and three patients had other concurrent vascular reconstructive procedures (aortobifemoral bypass for aortoiliac occlusive disease in two, thrombectomy of an occluded aortobifemoral bypass graft limb in one). Operative length was 5.3 ± 1.6 hours, and estimated blood loss was 1216 ± 1813 mL.

The technique for antegrade synthetic aortomesenteric bypass has been previously described[3] and can be briefly summarized. The supraceliac aorta and the origin of the celiac axis are exposed with division of the crus of the diaphragm, and the branches of the celiac axis are individually isolated in the gastrohepatic ligament. The proximal

Table III. Complications after synthetic antegrade mesenteric arterial bypass

Complication	*Patients*
Multiple organ dysfunction	30 (64%)
Mechanical ventilation >48 hours	25 (53%)
Sepsis	22 (47%)
Pneumonia	13 (28%)
Renal failure necessitating dialysis	5 (11%)
Urinary tract infection	9 (19%)
Myocardial infarction	1 (2%)
Significant arrhythmia	3 (6%)
Gastrointestinal bleeding	2 (4%)
Fascial dehiscence	1 (2%)

portion of the superior mesenteric artery then is isolated just distal to the pancreas, either after inferior retraction of the stomach or through the gastrocolic ligament. The bypass is done with either a 12 × 6–mm or 12 × 7–mm bifurcated Dacron graft. Supraceliac aortic control is obtained with a specially designed partial occlusion clamp, and the proximal anastomosis is done end-to-side with the limbs of the graft oriented on top of each other. The superior limb is used for the celiac axis bypass, and the inferior limb, used for the superior mesenteric artery bypass, is tunneled deep to the pancreas. The superior mesentery artery anastomosis is done end-to-side, and the celiac axis anastomosis is done end-to-end.

Values are expressed as mean ± standard deviation where appropriate. Patient survival and graft patency rates were determined with recommended life-table methods.[4] Preoperative and postoperative percent ideal body weights were compared with a paired *t* test, and a *P* value of less than .05 was accepted as significant.

RESULTS

Thirty-one patients (66%) had significant complications develop after antegrade prosthetic aortomesenteric arterial bypass, and 30 (64%) had multiple organ dysfunction develop with the defined criteria (Table III). Ten patients needed secondary procedures during the postoperative period (tracheostomy, n = 4; "second look" laparotomy, n = 3; femorofemoral bypass, n = 2; feeding jejunostomy, n = 1; abscess drainage, n = 1). No patient had graft occlusion, and only one patient had bowel necrosis. Intensive care unit length of stay was 18 ± 22 days, and total hospital length of stay was 32 ± 30 days. Five patients (10.6%) died before hospital discharge (postoperative days, 17, 20, 22, 28, and 121), four from multiple organ dysfunction and one from bowel infarction. Two of the patients who died of multiple organ dysfunction had worsening of their symptoms and underwent urgent mesenteric revascularization, and two had preoperative chronic renal insufficiency and died of renal failure after a decision to discontinue hemodialysis. All of these patients had patent mesenteric bypass grafts confirmed with mesenteric duplex ultrasound scan studies or autopsy. The remaining patient had heparin-induced thrombocytopenia develop and was found at exploratory laparotomy to have extensive small bowel and colon infarction incompatible with life despite a patent mesenteric bypass.

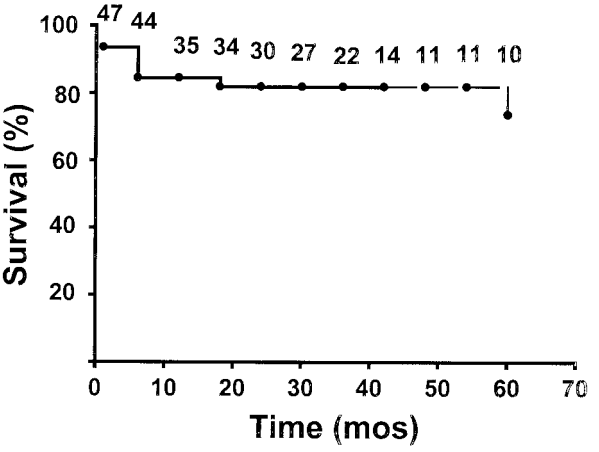

Fig 1. Patient survival rate after antegrade synthetic aortomesenteric artery bypass is shown with life-table analysis method. Numbers of patients at risk at beginning of interval are provided. *Broken lines* reflect SE more than 10%.

Thirty-three patients (79%) were discharged home, six (14%) were discharged to short-term rehabilitation facilities, and three (7%) were discharged to long-term care facilities. The six patients discharged to rehabilitation facilities all subsequently returned home. In contrast, two of the three patients sent to long-term care facilities died of pneumonia at 3 and 5 months after hospital discharge, and the third patient was alive but still in a long-term care facility at 21 months after discharge. Six patients died during long-term follow-up: one of myocardial infarction, one of congestive heart failure, and four of unknown causes. Thus, survival rate with life-table analysis at 5 years was 74% (standard error [SE], 12%; Fig 1; Appendix 1, online only). All patients had relief of preoperative abdominal pain after mesenteric bypass, and all but one were able to tolerate enteral nutrition by 18 ± 19 days (range, 4 to 115 days) after surgery. The one patient who could not tolerate enteral feedings had a combination of delayed gastric emptying and diarrhea and was discharged home on total parenteral nutrition. After 4 months, this patient's condition improved to the point that she could tolerate oral feedings, and her dysmotility symptoms were significantly improved at 2 years of follow-up. A total of 14 patients (33%) had significant postoperative diarrhea, nine of whom had similar preoperative symptoms. All patients with postoperative diarrhea reported a decreased number of bowel movements per day over time; however, 10 patients (24%) continued to report diarrhea for longer than 6 months. At 1 year after revascularization, 32 of 37 surviving patients (86%) with documented weights had actually gained weight. The exceptions had either severe comorbidities or severe diarrhea. Furthermore, mean percent ideal body weight increased from 87 ± 17% to 103 ± 23% ($P = .004$)

among those with documented weights. All patients who returned home were ambulatory and reported a return to baseline functional status.

Three patients had recurrent symptoms of mesenteric ischemia develop during follow-up. One patient had signs and symptoms of acute mesenteric ischemia 20 months after revascularization. The patient was found to have ischemic yet viable bowel at the time of emergency laparotomy and an occluded aortoceliac/superior mesenteric artery bypass graft. Notably, the patient had undergone repair of the inferior mesenteric artery at the original revascularization, and this remained patent. The patient underwent graft thrombectomy and revision of both the celiac and the superior mesenteric artery anastomoses and remains asymptomatic with normal mesenteric duplex ultrasound scan studies 17 months later. Two additional patients had less severe recurrent symptoms and abnormal mesenteric duplex ultrasound scan studies at 46 and 49 months. Arteriography in one patient revealed a high-grade stenosis of the hepatic artery anastomosis, and percutaneous angioplasty of that lesion resulted in good long-term symptom relief and subsequent normal duplex ultrasound scan studies. Arteriography in the second patient showed a high-grade stenosis of the superior mesenteric artery anastomosis that was repaired surgically, again with good long-term symptom relief and normal mesenteric duplex ultrasound scan studies. One additional patient without symptoms had an abnormal mesenteric duplex ultrasound scan study at 17 months of follow-up, and angiography showed both a kink of the celiac limb and a possible pseudoaneurysm of the superior mesenteric artery anastomosis. The kink in the celiac limb of the bypass and the superior mesenteric artery lesion, found to be a true aneurysm of the posterior wall of the superior mesenteric artery, were repaired surgically, and this patient remains asymptomatic and subsequently has had normal mesenteric duplex ultrasound scan studies. Thus, primary, primary assisted, and secondary patency rates were 69% (SE, 17%), 96% (SE, 7%), and 100%, respectively, at 5 years with life-table analysis (Figs 2, 3, and 4; Appendixes 2, 3, and 4, online only).

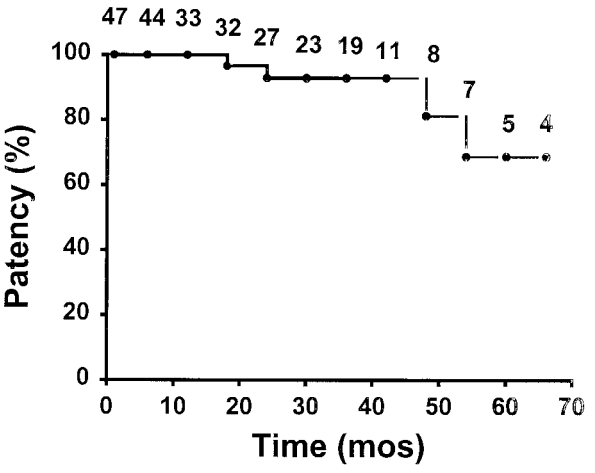

Fig 2. Primary graft patency rate after antegrade synthetic aortomesenteric artery bypass is shown with life-table analysis method. Numbers of patients at risk at beginning of interval are provided. *Broken lines* reflect SE more than 10%.

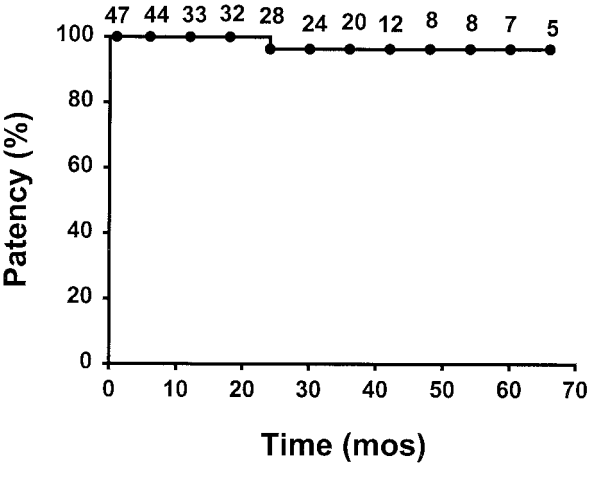

Fig 3. Primary assisted graft patency rate after antegrade synthetic aortomesenteric artery bypass is shown with life-table analysis method. Numbers of patients at risk at beginning of interval are provided.

DISCUSSION

The results of this study suggest that the treatment of chronic mesenteric ischemia with synthetic antegrade aortomesenteric bypass is associated with significant operative mortality and incidence of complication rates. Fortunately, the long-term outcomes as assessed with graft patency, functional status, symptomatic relief, and survival are all quite good. These findings are similar to those reported from other recent studies of the surgical treatment of chronic mesenteric ischemia, particularly those in which bypass graft patency was documented by objective means.[5-14] Reported operative mortality rate has ranged from 4% to 12%, long-term primary graft patency rate from 73% to 88%, rate of recurrence of symptoms long term from 3% to 11%, and 5-year survival rate after revascularization from 61% to 71%. In contrast, early graft thrombosis has been reported to occur in up to 6% of patients, and complications of recurrent mesenteric ischemia accounted for up to 33% of long-term deaths, neither of which were seen in this series. However, the relatively small number of patients reported in these series and the variety of surgical treatments preclude recommendation of one type of surgical therapy for the treatment of chronic mesenteric ischemia on the basis of observed differences in results.

Extensive functional outcome after open revascularization for chronic mesenteric ischemia has not been previously investigated to our knowledge. Notably, all patients had immediate relief of preoperative abdominal pain, as has been reported by other investigators,[5-14] and most gained

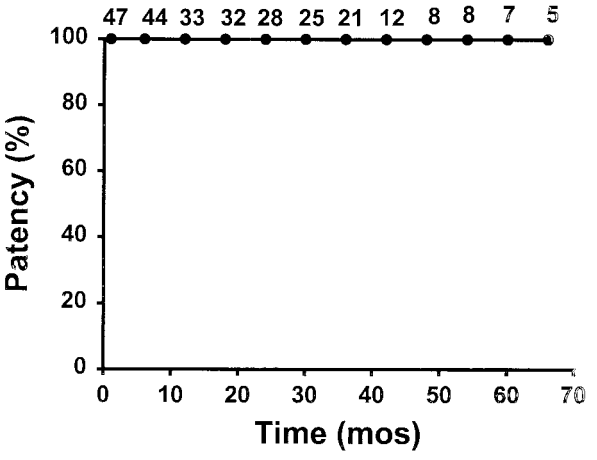

Fig 4. Secondary graft patency rate after antegrade synthetic aortomesenteric artery bypass is shown with life-table analysis method. Numbers of patients at risk at beginning of interval are provided.

significant weight, with the exceptions being those patients with significant comorbidities or significant diarrhea. In addition, most of those patients discharged were ambulatory and returned home to normal activities. The only consistently reported chronic postoperative problem was diarrhea that, unfortunately, occurred in approximately 25% of the survivors. The cause of this dysmotility problem is unclear; however, it was more common in patients with preoperative diarrhea and appeared unaffected by the adequacy of small bowel perfusion. Furthermore, it has been our anecdotal experience that it is not caused by enteric bacterial overgrowth because patients have been refractory to antibiotics.

We have chosen to treat patients with chronic mesenteric ischemia with antegrade synthetic multivessel aortomesenteric bypass on the basis of the relative simplicity of the procedure and on previously published reports suggesting the possible superiority of this approach. Johnston et al[8] reported a higher failure rate with retrograde bypasses done for chronic mesenteric ischemia when compared with prograde grafts. Furthermore, McAfee et al[11] reported higher patient survival and graft patency rates in patients who underwent complete mesenteric revascularization compared with those in whom revascularization was incomplete. However, none of these differences was statistically significant, and Foley et al[6] reported good long-term results in patients treated for chronic mesenteric ischemia with retrograde revascularization of the superior mesenteric artery alone. Although results for retrograde single-vessel bypass and antegrade multivessel revascularization appear similar, two potential problems with the retrograde single bypass approach raise concern. First, the infrarenal aorta, which is the inflow site for the retrograde bypass, is commonly diseased in patients with chronic mesenteric ischemia, and 25% of the patients in the series by Foley et al[6] needed aortic reconstruction as part of the mesenteric revascularization. Previous studies have suggested that combining mesenteric reconstruction with other vascular procedures results in significantly increased postoperative morbidity rate,[11] as has been our anecdotal experience. Second, and potentially more important, the failure of a single mesenteric bypass may be more likely to be associated with severe mesenteric ischemia than the failure of one of multiple mesenteric bypasses. Two of the three patients in the series of Foley et al[6] with late bypass graft failure died of complications of acute mesenteric ischemia. In contrast, no patient in the series by McMillan et al[12] (where complete revascularization was the goal) died of mesenteric ischemia because of late bypass graft failure and two thirds of the late graft occlusions were asymptomatic. Similarly, in this study, only the patient who had occlusion develop of both limbs of an antegrade aortoceliac/superior mesenteric artery bypass had acute mesenteric ischemia develop, and her bowel remained viable, likely because of the continued patency of a repaired inferior mesenteric artery. The other two patients in whom stenosis of single limbs of antegrade multivessel bypasses developed had only mild symptoms before graft repair.

Alternative treatments for patients with visceral artery occlusive disease, such as balloon angioplasty, must be compared with contemporary series of open surgical revascularization, including this study. Most of the studies documenting the efficacy of the endovascular approach in this setting are comprised of small numbers of patients with limited follow-up.[15-17] However, several observations are consistent in this limited experience. First, presumably because of the difficulty associated with endovascular treatment of occluded visceral vessels, most cases in the published series have involved stenotic rather than occluded vessels and are primarily single-vessel revascularizations of the superior mesenteric artery. Thus, the extent of mesenteric revascularization is less complete than most open surgical series. Second, and potentially because of this less complete revascularization, the results after endovascular treatment of patients with chronic mesenteric ischemia are marginal relative to open repair. Treatment-related mortality rate has ranged from 5% to 11%, initial symptomatic improvement has been achieved in only 70% to 80% of patients, and recurrent symptoms or restenosis have occurred in 20% to 30% of patients at 2 to 3 years of follow-up.[15-17] Notably, Kasirajan et al[17] compared endovascular and open surgical repair in patients with chronic mesenteric ischemia treated at the same institution and reported that posttreatment mortality and incidence of complication rates were the same, although the incidence rate of systemic complications was higher in the open surgical group.

Antegrade synthetic aortomesenteric bypass is a relatively straightforward procedure in most clinical settings and facilitates multivessel revascularization. The procedure is both effective and durable as reflected by long-term patient survival and freedom from symptoms of recurrent mesenteric ischemia. Furthermore, objective determination of graft patency is possible in the clinic setting with mesenteric duplex ultrasound scanning, thereby potentially

facilitating the identification of graft stenoses before graft failure and the development of acute mesenteric ischemia. However, the procedural associated morbidity and mortality rates remain significant, and further improvements in outcome must be achieved by reducing these adverse perioperative events in this difficult group of patients.

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DISCUSSION

Dr Frank W. LoGerfo (Boston, Mass). Dr Jimenez, thank you for this excellent presentation. I note in your experience, which has been similar to ours, the long duration of symptoms prior to these patients coming to surgery and the confusing nature of their symptoms. In your group, how many presented with a classic story of postprandial pain as opposed to other gastrointestinal symptoms? Secondly, when you do this operation, the most common one being bypass to the celiac or hepatic and the superior mesenteric artery, do you have any preference as to which vessel to reconstruct first, and are you using complete aortic occlusion or a side-biting clamp on that aorta?

Dr Javier Jimenez. Eighty-five percent of our patients reported classic postprandial-type pain that worsened after meals along with other symptoms of abdominal pain and diarrhea and such.

As far as the reconstruction, we preferably reconstruct the superior mesenteric artery, but again 45 of these bypasses were both to the celiac and superior mesenteric vessels.

The occlusion method we use at the supraceliac aorta preferentially is a partial occlusion clamp.

Dr Zwolak (Lebanon, NH). That was a very nice paper. I was wondering, in view of your excellent patency, about the actual utility and value of these duplex scans every 6 months, whether you really think it is important and valuable to get them. I think that in only one patient did the scan pick up some abnormality, in a patient who was presumably asymptomatic. What value is there to getting these scans every 6 months?

Dr Jimenez. Dr Zwolak, that is an excellent point and one that we have brought up. Yes, only one patient out of the 47 was asymptomatic and caught on surveillance duplex. This could be seen as a success or it could be seen as overuse of utilities, but in a large proportion of our patients, as you saw, 25% of them continue to complain of diarrhea, and, at times, this mesenteric duplex helps to distinguish whether this diarrhea is simply a postoperative phenomenon that continues on and their bypass is patent or whether there is recurrence of disease. That is where we stand with our duplex examination.

Dr A. David Drezner (Hartford, Conn). I notice that eight patients had inferior mesenteric artery bypasses also. I am wondering what the indication was for that and what the patency rate was for that particular bypass.

Dr Jimenez. Sir, we tried to vascularize as many of the mesenteric vessels as possible. In those eight patients, the simple answer is it was easy to vascularize the inferior mesenteric artery because the infrarenal aorta is soft, technically simple, and did not prolong the operation an extensive period of time. We do see it as valuable. We do have one patient that recurred acutely. That bypass was occluded. That patient did though also have revascularization of the inferior mesenteric artery, and we believe that patient's bowel was maintained for that short period of time due to that revascularization. Summarizing this answer, we try to revascularize as many inferior mesenteric arteries as possible but, on the other hand, without prolonging the operation too much as long as it is technically feasible.

Dr Robert Patterson (Providence, RI). Do you have any information on associated renovascular disease with this procedure? How many times did you deal with renovascular disease, and how did you manage this disease when it was discovered? Did renal artery involvement have any effect on the perioperative morbidity and mortality of your patients?

Dr Jimenez. There were only one or two patients in this series with associated renovascular disease. In this series, there is only one patient who had revascularization of their renal artery disease, so there is only one patient to be able to give you any significant data on that.

Dr David Brewster (Boston, Mass). Can you just tell us briefly about what operative incision and approach you use for your procedures? Secondly, many of these patients have orificial disease, and in those circumstances, we have often found transaortic thromboendarterectomy to be a useful method. Were all of your operations bypass or did you have any experience with endarterectomy, and what are your views on that approach?

Dr Jimenez. The first question is the approach we used, and the approach we use is a transperitoneal approach either through a midline or a bilateral subcostal incision.

The second question, as far as endarterectomy, we have a very limited experience with endarterectomy, mostly from our senior mentor who does not like that approach.

Unidentified speaker. I believe seven of your patients had undergone prior angioplasty. What are your criteria for selecting angioplasty versus bypass?

Dr Jimenez. At our institution, our angiographers are very conservative as far as angioplasting these lesions, and our experience is small as far as angioplasting these lesions. The criteria we use are, one, a patient who is extremely debilitated and we feel that their mortality from surgery is going to be high and this may be a bridge to improve their overall nutritional state. The other indication that we may use is those patients in whom the chronic mesenteric ischemia is not totally confirmed and in this case an attempt at angioplasty to see if there is any relief of symptoms.